March 1, 2005

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judges:

E. Roy Hawkens, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr. Robin Brett, Special Assistant

In the Matter of:	
HYDRO RESOURCES, INC. P.O. Box 777 Crownpoint, New Mexico 87313	Docket No. 40-8968-ML ASLBP No. 95-706-01-ML

DECLARATION OF DR. JOHN W. LEEPER

I, John W. Leeper, do hereby swear that the following is true to the best of my knowledge. I am qualified and competent to give this declaration, and the factual statements herein are true and correct to the best of my knowledge, information and belief. The opinions expressed herein are based on my best professional judgment.

Name and Title

1. My name is John W. Leeper. I am the Branch Manager of the Water Management Branch of the Navajo Nation Department of Water Resources, P.O. Drawer 678, Fort Defiance, Arizona, 86504.

Professional Qualifications

2. My education and experience as a professional engineer are described in my résumé, attached to this testimony as **Exhibit A**. I am a registered professional engineer in the States of Arizona and California. I have a B.S. in Civil Engineering from the University of California at Davis, a M.S. in Civil Engineering from the California State University at Los Angeles, a Ph.D. from the Colorado State University in Fort Collins, and more than 15 years of experience in hydrology and water resources planning and management.

3. Based on my education and experience, I have substantial expertise with the planning and management of the Navajo Nation's water resources. I spent five years working for Stetson Engineers, Inc. in San Rafael, California. While with Stetson Engineers I worked on technical water rights studies for the Campo Bands in Southern California, the Flathead and Fort Belknap Indian Reservations in Montana, the Nez Perce Reservation in Idaho, the Warm Springs Reservation in Oregon, and the Hopi, Zuni and Navajo Reservations in Arizona and New Mexico. I spent an additional five years working for Natural Resources Consulting Engineers, Inc. (NRCE) in Fort Collins, Colorado. While with NRCE I provided technical support to the Office of the Tribal Water Engineer of the Shoshone and Arapaho Tribes in Fort Washakie Wyoming, and I worked on technical studies in support of the Little Colorado River general stream adjudication, and on water development projects for the Government of Eritrea.

4. Since April 1995, I have been a Civil Engineer with the Navajo Department of Water Resources in Fort Defiance, Arizona. Since 1997, I have been the branch manager of the Department's Water Management Branch. As the branch manager, I manage more than 20 hydrologists and technicians who are responsible for: 1) providing technical support to the Navajo Nation's water rights effort in five ongoing general stream adjudications in Utah,

Arizona, and New Mexico, 2) operating snow surveys, climate stations, observation wells, surface gages and other water monitoring functions on the Navajo Reservation, 3) providing information for drought response and mitigation, 4) providing flood plain management, 5) assisting with watershed restoration, and 6) regional water planning including water projects for irrigation, municipal, and industrial purposes.

5. As a professional civil engineer working for the Navajo Nation, I supervised water development investigations on several proposed Navajo Nation municipal water projects including the Navajo Gallup Water Supply Project, the Farmington to Shiprock Pipeline, the Three Canyon Water Supply Project, and the Western Navajo Pipeline, among others. I understand the design and planning criteria that are used by the Navajo Nation and the federal agencies to develop these projects.

6. While working for the Navajo Department of Water Resources I supervised the preparation of more than 15 technical reports dealing with water rights protection and water resources planning and management for the Navajo Nation. A list of these reports is provided in my attached résumé (**Exhibit A**).

Purpose of testimony

7. The purpose of this testimony is to describe the importance of the Morrison and Cow Springs formations as current and future sources of municipal water for the Navajo Nation in the Eastern Agency; to describe the role of the Navajo Nation's laws, regulations, and policies that are established to protect and manage the resources, including the Navajo Nation Water Code; and to provide an estimate of the commercial value of the resource to the Navajo Nation.

Licensing Materials and Literature Reviewed

8. In preparing this testimony, I reviewed the *Final Environmental Impact Statement* ("FEIS") for the proposed HRI Crownpoint Project (NUREG-1508, February 1997). I also reviewed and relied on the following relevant reports:

Balleau Groundwater, Inc., 1998. Simulated Loading of Existing Wells, Navajo Nation Exhibit 30, in the matter of Hydro Resources, Inc., Water Rights Transfer Application before the New Mexico State Engineer, Hearing G-11-A, March.

Bureau of Reclamation – Western Colorado Area Office and Technical Services Center, 2002. *Navajo Gallup Water Supply Project, Appraisal Level Designs and Cost Estimates,* Durango, Colorado and Denver, Colorado.

Church Rock Uranium Monitoring Project (CRUMP), 2004. Water Sources and Water Quality Data in Church Rock Area, 2003. Church Rock Chapter, Navajo Nation, New Mexico.

EcoSystem Management, Inc., 2003. *Sanitary Assessment of Drinking Water Used by Navajo Residents not connected to Public Water System Report,* Albuquerque, New Mexico.

HDR Engineering, Inc., 2004. *Western Navajo-Hopi Water Supply Assessment,* Omaha, Nebraska.

Klausing, R. L., and Welder, G. E., 1983. Data for Ground-water Studies of the San Juan Basin, New Mexico (1982-83). U.S. Geological Survey (Albuquerque, N.M.), Open-File Report 84-135.

Lexicon, Inc., 1999. *The Costs, Benefits, and Public Policy Merits of the Proposed Western Navajo Hopi Lake Powell Pipeline,* Boston, Massachusetts.

Navajo Nation Department of Water Resources, 1998. Well records and water resource data on Kerr-McGee Church Rock II Well W-2.

Navajo Nation Department of Water Resources, 2000. *Water Resources Development Strategy for the Navajo Nation, July 17, 2000*, Fort Defiance, Arizona.

Navajo Nation Department of Water Resources, 2001. *Final Draft, Technical Memorandum, The Navajo-Gallup Water Supply Project, March 16, 2001*, Fort Defiance, Arizona.

Navajo Nation Division of Economic Development, 2003. *2002 – 2003 Comprehensive Economic Development Strategy*, Window Rock, Arizona.

Northwest Economic Associations, 1993. *Support Documentation for Current and Projected Population of the Little Colorado River and N-aquifer Basins*, Vancouver, Washington.

Tetra Tech, Inc., 2004. *Summary Report, Crownpoint, New Mexico Water Distribution System Analysis*, Greenwood Village, Colorado.

United Nuclear Corporation, 2004. Northeast Church Rock Mine Closeout Plan, prepared by MWH, Steamboat Springs, Colorado, January.

Summary of Expert Findings

9. It is my professional opinion that during the next forty years, the Navajo Nation will increase its utilization of groundwater throughout the Eastern Navajo Agency, and specifically from the Morrison and Cow Springs formations for municipal water supply, including domestic purposes.

10. The Dakota Sandstone, Westwater Canyon and Cow Springs Sandstone aquifers are used extensively for municipal, domestic and livestock water supplies in the Crownpoint and Church Rock, N.M., areas and meet the definition of underground sources of drinking water.

11. I have also concluded that the current Navajo Nation water use fee schedule established by the Navajo Nation Resources Committee in 1997, which sets the water use fee at $0.27 per thousand gallons ($88 per acre-foot per year) for commercial purposes and $2.70 per thousand gallons ($880 per acre-foot per year) for industrial purposes, reflects a reasonable range of the economic opportunity cost, if for any reason these water sources are jeopardized and therefore cannot be developed in the future.

12. In the remainder of this declaration, I conclude that the non-commercial value of the water needed for a sustainable economy and permanent homeland for the Navajo people can be considered to be much greater than the commercial opportunity costs if there is a significant risk to the drinking-water wells that lie in the vicinity of the communities of Church Rock or Crownpoint. A summary of my findings and professional opinions conclude my testimony.

(A) During the next 40 years, the Navajo Nation will increase its utilization of the Morrison and Cow Springs formations

1) The Navajo Nation Department of Water Resources projects that he total annual municipal water supply capacity on the Navajo Nation will need to increase six-fold over the next 40 years.

13. The Navajo Nation Department of Water Resources ("NDWR") projects that between now and 2040, the total municipal water demand on the Navajo Nation will increase by almost a factor of six. The Navajo Gallup Water Supply Project ("NGWSP") has been proposed to help meet the municipal demands of approximately 40 Navajo chapters, many of which are located in the Eastern Navajo Agency. The Navajo Chapters included in the Navajo Gallup Project service area are shown in **Table 1**. The projected 2040 water demand of this service area is approximately 52,000 acre-feet per year. The Navajo Nation DWR bases its municipal demand projections on the U.S. Census Bureau data with an adjustment for any documented undercount, a growth rate of 2.48 percent, and a per capita water user rate of 160 gallons per capita per day. These growth projections have been re-affirmed in investigations by the U.S. Bureau of Reclamation in 1994 and again in 2004, by Colorado State University in 1989, and by Northwest Economic Associates in 1993 and again in 2003. These values were most recently affirmed in 2003 by HDR Engineering, Inc. in the Western Navajo Hopi Water Supply Study. The projected per capita water use rate reflects the assumption that water use will increase with community growth, development and an improved economic standard of living.

2) The NDWR recommends the use of groundwater for municipal purposes as long as the rate of pumping is within sustainable limits.

14. On the Navajo Nation, including the NGWSP service area, the NDWR recommends the use of groundwater for municipal purposes so long as that use is within sustainable limits. Groundwater has been incorporated in the NGWSP conjunctive groundwater

component. One reason for a NGWSP conjunctive groundwater component is to keep the State of New Mexico within its compact allocation of the Upper Colorado River Basin water supply. In the Hydrologic Determination approved by the Secretary of the Interior on February 2, 1989, the Bureau of Reclamation determined that the yield available of Upper Basin Colorado River water supply for use within the State of New Mexico is 699,400 acre-feet per year. Based on the State of New Mexico Schedule of Anticipated Upper Basin Depletions dated November 18, 2004, by 2060 the total depletions of this supply will total 667,000 acre-feet per year. If the groundwater component were eliminated, then the State's projected depletions would come closer to, or possibly exceed, this compact limitation.

15. A second reason for the conjunctive groundwater component is that it reduces potential impacts of the NGWSP's water diversions on the endangered species in the San Juan River. In the 1990's the U.S. Fish and Wildlife Service (USFWS) issued a biological opinion that concluded that additional depletions from the San Juan River could jeopardize the continuing existence of the endangered Colorado pike minnow and razorback sucker. To enable additional diversions from the river, a recovery program was established that has proposed flow recommendations for the river. At the current time the Bureau of Reclamation estimates that the State of New Mexico has 600,147 acre-feet of depletions that have been consulted on by the USFWS, or are otherwise included in the environmental baseline (excluding the Animas La Plata Project). The Bureau of Reclamation is currently engaged in consultation with the USFWS to develop a biological assessment and biological opinion regarding the NGWSP's surface water diversion from the San Juan River. Preliminary hydrological modeling indicates that, at the current time, it may not be possible to incorporate new depletions into the revised environmental

baseline for the entire NGWSP demands. If the groundwater component were eliminated, then the potential baseline shortage may be greater.

16. A third reason for the conjunctive groundwater component is that, based on the current construction schedules, many of the surface water components will not be completed until 2020. The conjunctive groundwater component will provide critically needed municipal water supplies at a much earlier date.

17. And, a fourth reason for the conjunctive groundwater component is that it can provide limited quantities of water more economically than the surface water components, and, by incorporating the additional water source, the redundancy and reliability of the NGWSP water supply is increased.

18. The U.S. Bureau of Reclamation in 2004 estimated that the cost of the NGWSP surface water components is $589 million. The NDWR estimated that the cost of the conjunctive groundwater component is an additional $77 million in 2004 dollars. Both the surface water components and the conjunctive groundwater component will be needed to meet the project municipal demand in the service area. And, both have been incorporated into the Navajo Nation San Juan River Settlement Agreement, which was approved by the Navajo Nation Council and the New Mexico Interstate Stream Commission.

3) The NDWR projects that the use of the Morrison and Westwater formation will increase during the next 40 years.

19. The NDWR estimated that in 1998 Navajo municipal groundwater production in the Navajo Gallup service area was 2,540 acre-feet per year. With the conjunctive groundwater component, the Navajo municipal groundwater production in the area will increase to approximately 3,185 acre-feet per year. The NDWR staff believes that this level of groundwater development is sustainable. Groundwater use in the Crownpoint Area is projected to increase

from approximately 330 to 750 acre-feet per year. And, the Navajo groundwater use in the Gallup Area, which includes the Church Rock Chapter, is projected to increase from 328 to 502 acre-feet per year. These values are shown in **Table 1**.

Table 1. Recommended NGWSP Municipal Conjunctive Groundwater Development

Municipal Subarea and Chapters	1998 G.W. Production (Acre-feet/year)	Proposed 2040 Production (Acre-feet/year)	Potential Source Formations
Central (Burnham, Lake Valley, White Rock, and White Horse Lake)	27	77	Gallup, Dakota, Morrison, alluvium, and Menefee
Crownpoint (Becenti, Coyote Canyon, Crownpoint, Dalton Pass, Little Water, Standing Rock	330	752	Dalton sandstone, Westwater Sandstone, Gallup Sandstone, and Dakota
Huerfano (Huerfano, Nageezi)	90	46	Ojo Alamo
Gallup Area (Bread Springs, Chichilta, Church Rock, Iyanbito, Mariano Lake, Pinedale, Red Rock)	328	502	Gallup sandstone, Chinlee, Glorietta, Westwater, Cowsprings, and Dakota.
Rock Springs (Manuelito, Rock Springs, Tsayatoh)	58	169	Gallup Sandstone
Route 491 (Mexican Springs, Naschitti, Newcomb, Sanostee, Sheep Springs, Tohatchi, Twin Lake, Two Grey Hills)	551	795	Point Lookout Sandstone
Torreon (Counselor, Ojo Encino, Pueblo Pintado, Torreon)	113	77	Menefee
Window Rock	1043	767	Gallup, Dakota, and Morrison
Navajo Total	2,540	3,185	

Source: Navajo Nation Department of Water Resources, 2001.

20. To better anticipate the short term, mid term, and long term water development needs of the Navajo Gallup study area, in 2004 the Bureau of Reclamation contracted with Tetra Tech, Inc. to analyze the Crownpoint public water system which supplies drinking water to the Chapters of Crownpoint, Dalton Pass (or Nahodishgizh), Becenti, and Littlewater. Tetra Tech,

Inc. (2004) concluded that the near term water development scenario requires the installation of six new wells from the Westwater Canyon and Cow Springs sandstones to obtain up to 614 acre-feet per year.

21. Since the Tetra Tech report was finalized, the NDWR has received comments that the Navajo Housing Authority is planning to expand its housing development in Becenti with the addition of several hundred new homes. Becenti Chapter is located about five miles north of Crownpoint and is served by the Navajo Tribal Utility Authority ("NTUA") Crownpoint water system that pumps groundwater from three wells completed in the Westwater Canyon Aquifer. The Indian Health Service has conceptual plans to serve the Lake Valley Area (about 20 miles north of Crownpoint) from an inter-tie with the Crownpoint public water system. This Lake Valley Chapter demand is projected to be approximately 260 acre-feet per year in 2040. Either of these developments will significantly increase the projected water demand on the Crownpoint public water system. The Navajo Housing Authority also has contacted the NDWR regarding it proposed 1,000-home Springstead Estates Housing Development in Church Rock Chapter.

(B) The Westwater Canyon and Dakota Sandstone Aquifers are used extensively for drinking water in the Eastern Navajo Agency and meet the definition of underground sources of drinking water.

22. The Westwater Canyon Aquifer ("WCA") is a subunit of the Morrison Formation, which the *Navajo Gallup Water Supply Project Technical Memorandum* reports as providing in 1998 more than 300 acre-feet of groundwater for municipal use. Records in the NDWR water well data base show that at least 16 water wells are completed in the WCA in the Church Rock-Crownpoint region. Of those, at least nine are municipal water supply wells: two in Mariano

Lake Chapter; one in Standing Rock Chapter located nine miles west of Crownpoint; five[1] in the town of Crownpoint, including three that are operated by the Bureau of Indian Affairs; and one in Littlewater Chapter, located 10 miles southeast of Crownpoint.

23. As shown in **Table 2** below, at least 13,145 residents obtain drinking water regularly from Westwater Canyon wells that serve the Crownpoint and Mariano Lake water systems operated by the Navajo Tribal Utility Authority ("NTUA"). The "Crownpoint System" serves homes in Nahodishgizh, Crownpoint, Becenti and Littlewater chapters; the "Mariano Lake" system serves homes in Mariano Lake, Pinedale, Casamera Lake, Smith Lake and Church Rock chapters. The compilation in **Table 2** assumes 4.3 persons per Navajo household and 2.6 persons per non-Navajo household.[2] NDWR data indicate that more than 10 percent of the households in Crownpoint Chapter haul drinking water primarily from the Crownpoint Chapter House. These families live outside of Crownpoint in rural areas not served directly by the NTUA public water systems.

24. The estimated population in **Table 2** is likely *underestimated* because it does not include non-boarding students, staff and faculty at the elementary, middle, and high schools in Crownpoint and at Crownpoint Institute of Technology, also in Crownpoint. Neither does the estimate include the 230 employees and 5,000 patients per month at the Crownpoint Comprehensive Healthcare Facility, a U.S. Public Health Service-Indian Health Service hospital and clinic. Students, staff and faculty at schools and other major facilities in Mariano Lake and Church Rock also are not included in the estimate. The actual number of people who depend on

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[1] Well logs indicate that two of the BIA wells are screened in both the Dakota Sandstone and Westwater Canyon aquifers.

[2] These rates are based on the 2000 Census and come from three sources: NNDCED, 2003, the NDWR Drought Response Plan, 2002, and the World Almanac, 2005.

Table 2. Estimated Eastern Navajo Agency Population Using Water Supply Wells Completed in the Westwater Canyon Aquifer (Current and Near-Term User Populations)[3]

Population/Community Served	NTUA	BIA	Total People Served[a]
Current Number of Connections, User Populations			
Crownpoint, Nahodishgizh, Becenti, Littlewater chapter connections	1,140	230	5,891
Crownpoint Institute of Technology: Resident students living in dorms	Single connection	None	101
Crownpoint Community School: One-third of 459 students live in on-campus dorms	None	Single connection	151
Crownpoint High School-Middle School faculty housing complex	80[b]	None	208
Crownpoint Chapter House water station: averages about 600 customers per month	Appx. 150[c]	None	645
Mariano Lake, Pinedale, Church Rock chapters (plus "Kerr-McGee Camp" and Hardground Flats Canyon) connections	1,120	No data	4,816
Subtotal Current Connections, Total People Served	At least 2,340	At least 230	11,812
System Expansion by Early 2006, Number of Connections, User Populations			
Becenti Chapter, new connections (estimated)	120	None	516
Crownpoint Chapter, new connections (estimated)	100	None	430
Church Rock Chapter, new connections (est'd)	90	No data	387
Subtotal of System Expansion by Early 2006	310	---	1,333
Estimated current and near-term population served by Westwater Canyon Aquifer in Eastern Navajo Agency			**13,145**

[a] Derived by multiplying number of connections in NTUA and BIA systems by 4.3, the average number of persons per Navajo household (2000 Census).

[b] Since the majority of occupants of school housing is non-Navajo individuals and families, these connections are multiplied by 2.6, the average number of persons per household in the U.S. (See, The World Almanac and Book of Facts 2005 at 627.)

[c] This number of "connections" or "households" is based on the assumption that the "average" customer hauls water from the Chapter House once per week, or four times per month, and that this customer represents a "household" or "family." Hence, the estimated number of people served is derived by multiplying 150 by 4.3 persons per household.

[3] Data provided by M. Capitan, customer service supervisor, Navajo Tribal Utility Authority, Crownpoint Office; personal communication, February 23, 2005.

Westwater Canyon Aquifer wells for drinking water in the Church Rock-Crownpoint region may exceed 15,000.

25. The overall water quality in the Westwater wells for which the NDWR has information or has obtained documentation is excellent. The high quality of the WCA groundwater in Crownpoint municipal wells is shown in the FEIS (Table 3.12 at 3-26) and in Safe Drinking Water Act compliance data I obtained from NTUA. Water quality data[4] for general chemistry, heavy metals and radionuclides in the NTUA-1 and NTUA-2 municipal wells for 2003 and 2004 are shown in **Table 3**. Total dissolved solids ("TDS"), uranium and radium-226 from the 1990 and 2003 samples for the two Crownpoint wells are summarized in **Table 4.** In neither the 1990 analyses nor the 2003-2004 analyses of Crownpoint town well water did any contaminant exceed its corresponding primary or secondary maximum contaminant level.

26. Use of water from unregulated WCA wells for domestic purposes (including drinking water) and livestock watering is also extensive in the area. A 1998 compilation by Balleau Groundwater, Inc., for the Navajo Nation Justice Department contained 22 WCA wells located in a 20-mile radius of HRI's Church Rock mining sites; the list of those wells were obtained from NNDWR records (Balleau, 1998). At least four of those WCA wells are known to exist within 3 miles of the proposed HRI Church Rock Section 8 and Section 17 ISL mines. The names, locations, TDS values, sample dates, uses and status of those wells are shown in **Table 5**.

27. Use of water from the Dakota Sandstone and Cow Springs Sandston aquifers for municipal, domestic and livestock uses is also extensive in the Church Rock-Crownpoint area. NDWR records show five water supply wells in the Dakota and two in the Cow Springs.

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[4] Analyses for pesticides, chlorination byproducts and volatile and synthetic organic contaminants regulated by USEPA and the Navajo Nation were at or below detection limits, and therefore excluded from Table 3.

Table 3. Crownpoint Water System Water Quality Data (Source: NTUA)

Constituent	Sample Date	Units	MCL	Crownpoint-1	Crownpoint-2
Metals, General Chemistry:					
Alkalinity, total (CaCO3)	5/27/2003	mg/l		140.0	16.0
Antimony	5/27/2003	mg/l	0.006	<0.003	<0.003
Arsenic	5/27/2003	mg/l	0.05	<0.005	<0.005
Barium	5/27/2003	mg/l	2.0	<0.1	0.161
Beryllium	5/27/2003	mg/l	0.004	<0.0002	<0.0002
Cadmium	5/27/2003	mg/l	0.005	<0.0002	<0.0002
Calcium	5/27/2003	mg/l	75-200	4.8	3.2
Calcium (CaCO3)	5/27/2003	mg/l	75-200	12.0	8.0
Chromium	5/27/2003	mg/l	0.05	<0.02	<0.001
Conductivity	5/27/2003	umhos/cm		420.0	490
Copper	5/27/2003	mg/l	1.3	<0.02	<0.02
Cyanide, free	5/27/2003	mg/l		0.135	<0.1
Fluoride, lab	5/27/2003	mg/l		0.5	0.5
Hardness, total	5/27/2003	mg/l	500	20.0	12
Iron	5/27/2003	mg/l	0.3	0.191	<0.1
Lead	5/27/2003	mg/l	0.02	<0.001	
Magnesium	5/27/2003	mg/l		2.0	0.97
Magnesium (CaCO3)	5/27/2003	mg/l		8.0	4.0
Manganese	5/27/2003	mg/l	0.05	0.012	<0.01
Mercury	5/27/2003	mg/l	0.002	<0.0002	<0.0002
Nickel	5/27/2003	mg/l	0.1	<0.04	<0.04
Nitrate	8/10/2004	mg/l	10.0	<0.3	<0.3
Nitrite	8/10/2004	mg/l	1.0	<0.3	<0.3
PH	5/27/2003		6.5-8.5	8.3	8.4
Potassium	5/27/2003	mg/l		1.94	0.85
Selenium	5/27/2003	mg/l	0.05	<0.005	<0.005
Sodium	5/27/2003	mg/l		85.5	95.9
Thallium	5/27/2003	mg/l	0.002	<0.002	<0.002
Total Dissolved Solids	5/27/2003	mg/l	500	320	340
Turbidity	5/27/2003	ntu	1.0	0.17	0.11
Zinc	5/27/2003	mg/l	5.0	0.011	<0.005
Radioachemistry:					
Gross Alpha Activity	6/4/2003	pCi/l	15.0	1.1 +/- 0.5	<0.3
Gross Alpha, Adjusted	6/4/2003	pCi/l			<0.5
Radium-226	6/4/2003	pCi/l		<0.3	<0.5
Radium-228	6/4/2003	pCi/l		<0.4	<0.2
Radium, total	6/4/2003	pCi/l	5.0	<0.4	<0.4
Uranium Activity	6/4/2003	pCi/l		<0.5	<0.5

Table 4. Selected Contaminant Levels in Town of Crownpoint Municipal Wells

Parameter	Sample Year	No. Town Wells	Ave. Concentration	USEPA/NN MCL
Total Dissolved Solids ("TDS")	1990 2003	4 2	371 mg/l 330 mg/l	500 mg/
Uranium	1990 2003	4 2	<0.01 mg/l 0.0007 mg/l*	0.03 mg/l
Radium-226	1990 2003	4 2	0.45 pCi/l <0.40 pCi/l	5.0 pCi/l

Sources: NTUA, 2005;.

*This concentration was derived by dividing the average uranium activity in NTUA-1 and NTUA-2 of <0.4 pCi/l by the conversion factor used by the NRC, 0.68 pCi per mg.

Table 5. Non-public water supply wells completed in the Westwater Canyon Aquifer in the Church Rock Area

Well No.	Location	TDS (mg/l)	Sample Date(s)	Uses; Current Status
16T-513	16.16.15.4322	1430	7/27/59	Inoperable; awaiting repair; domestic and livestock uses
16T-534	16.17.21.344	812 780	10/29/03 7/29/65	Operating; frequently used for water hauling by local residents; domestic, livestock watering
KM-CRII W2	17.16.22.432	330 896	5/17/78 5/8/80	Plugged and abandoned in '94 at Kerr-McGee Church Rock Mine; domestic use
UNC Mill Well	16.16.2.111	335 228 292 2258 2090	8/12/76 10/9/84 4/23/92 7/28/93 6/18/02	Operational, but not available to general public; domestic use

Sources: CRUMP 2004; Klausing and Welder (1983); NNDWR 1998; UNC 2004;.

28. The federal Safe Drinking Water Act ("SDWA") defines an "underground source of drinking water" ("USDW") as an aquifer that: (1) supplies any public water system, or (2) contains enough groundwater to supply a public water system and either currently supplies drinking water for human consumption or contains fewer than 10,000 mg/l TDS or less. See, 40 CFR §144.3. In my professional opinion, the Dakota and Westwater Canyon Aquifers in the Church Rock-Crownpoint regions qualify as USDWs. They both supply water to public water

systems (in Becenti, Church Rock, Crownpoint, Littlewater, Mariano Lake, Nahodishgizh, Pinedale, Smith Lake and Standing Rock chapters), and they contain enough water to supply a public water system, as documented in the *Navajo Gallup Water Supply Project Technical Memorandum* (at Section 5.2). These aquifers are currently used for drinking water for human consumption, and they have a natural TDS concentration that is far less than 10,000 mg/l. With respect to the Crownpoint area, the NRC agrees: "Water near the town of Crownpoint in the Westwater Canyon Member and the Dakota Sandstone currently meets all of the [SDWA] criteria" as an underground source of drinking water. The Westwater and Dakota aquifers are USDWs in the Church Rock area, too, because non-public water supply wells that tap those formations in that area have been used, and are being used, for human drinking water and there is enough water in storage in the aquifers to develop a public water supply.

29. While current use of the Cow Springs aquifer is limited, it contains enough water to supply a public water system. The Cow Springs is the most likely aquifer to be tapped for the municipal supply for the planned Springstead Estates Housing Development 2 miles south of Section 17, and the Bureau of Reclamation has proposed it as a water source for the short term expansion of the Crownpoint Regional Public Water System. Therefore, I conclude that the Cow Springs aquifer also qualifies as a USDW.

30. The Navajo Safe Drinking Water Act ("NSDWA") (22 N.N.C. Chapter 7 Subchapter 15) states, "It is the policy of the Navajo Nation to protect the health and welfare of the Navajo people by ensuring that the water is safe for drinking and other purposes." See, NSDWA §104.7. The Navajo Nation Water Code also clearly enunciates the Nation's policy toward protecting surface and subsurface water supplies: " to protect the health, the welfare, and the economic security of the citizens of the Navajo Nation; to develop, manage and preserve the

water resources of the Navajo Nation" (Title 22, NTC, Chapter 11, Subchapter 1, Section 1101). Since the Navajo Nation considers the Dakota, Westwater and Cow Springs aquifers in the Church Rock and Crownpoint areas to be underground sources of drinking water available for current and future drinking water supplies, these statutory policies of the Navajo Nation dictate that groundwater quality in these aquifers not be degraded in a manner that precludes current or future development of the water resources in them.

31. The NDWR and other agencies of the Navajo Nation are aware of the extensive impacts of previous uranium mining on the lands and water resources in the Church Rock area. With respect to the proposed ISL mines at Section 8 and Section 17 in Church Rock, the NDWR is aware that previous underground mining likely contributed to degradation of groundwater quality on those properties. Such degradation may inhibit, if not preclude, future development of groundwater contiguous to those lands, say in Sections 9, 16 and 20 of T16N, R16W. However, considering that groundwater in the Westwater Canyon Aquifer is of high quality throughout the southern portion of the San Juan Basin, and in light of the fact that the WCA is critical for future conjunctive water supplies, I believe that the Navajo Nation's policies require groundwater outside of the proposed mining zones at Sections 8 and 17 to be protected as if they were current sources of municipal drinking water supplies.

(C) The current Navajo Nation water use fee schedule established by the Navajo Nation Resources Committee in 1999 is a reasonable commercial opportunity cost, if for any reason these water sources are jeopardized and therefore cannot be developed

32. Establishing a specific economic value for water on the Navajo Nation can be very difficult because the value of water is very fact specific. Water is rarely bought and sold on open unregulated markets, but instead it is integrated into a system of water laws and regulations than restrict many marketing opportunities. The value of water can be further impacted by the

quality, reliability, development costs, operation and maintenance assessments, institutional constraints, policy objectives, and availability of less costly alternatives. Although the following descriptions of regional transfers are not specifically comparable benchmarks, they are intended to illustrate a range for regional water prices. Examples of regional rates are provided for the States of California, Arizona, Colorado, and New Mexico. For comparison purposes, long-term lease rates and water rights acquisitions are annualized, and annual lease rates are converted to a present value of a long-term lease. The annualized and present value rates are based on amortizing at a 4 percent discount rate over a 50-year period.

33. In 1992 the Metropolitan Water District agreed to pay the Palo Verde Irrigation District $134.78 per acre-foot per year, which has a long term present value of $2,900 per acre-foot. In 1995 the Southern Nevada Water Authority and Metropolitan Water District agreed to pay $1,766 per acre-foot, which is an annualized rate of $82 per acre-foot per year. In 1995 the MWD agreed to pay the Imperial Irrigation District $2,198 per acre-foot, which is an annualized rate of $102 per acre-foot per year. For the 2000/2001 fiscal years, BIA Navajo Indian Irrigation Project contractors tabulated the Environmental Water Account Acquisitions for the State of California. The tabulation includes 23 irrigation to municipal water transfers in California for more than 1.2 million acre-feet of water. That tabulation indicated a minimum annual value of $75 per acre-foot per year, an average of $148 per acre-foot per year, and a maximum of $360 per acre-foot per year.

34. In 1995 the City of Scotsdale, Arizona, acquired Central Arizona Project water for $1,100 per acre-foot, which is an annualized rate of $41 dollars per acre-foot year. In 2003 the Arizona Department of Water Resources reported that the Salt River Pima-Maricopa Tribe entered into long term water leases for $1,430 acre-foot, which is an annualized rate of $66.5 per

acre-foot per year, Fort McDowell Yavapai-Apache Tribe entered into a lease for $1,900 per acre foot, which is an annualized rate of $88.4 per acre-foot per year, and that the Gila Indian Community proposed a long term lease for $2,100 per acre-foot, which is $97.7 per acre-foot per year.

35. In 2003 it was reported in the *Farmington Daily Times* that the City of Bloomfield acquired water rights in the San Juan River basin for $2,300 per acre-foot, which is an annualized rate of $107 per acre-foot per year. In 2004 the Navajo Nation protested a transfer of irrigation rights to the City of Bloomfield, which were offered to the City at $1,458 per acre-foot, which is an annualized rate of $67 per acre-foot per year. In 2001 the Jicarilla Apache Nation subcontracted Navajo Reservoir water to the San Juan Generating Station for approximately $75 per acre-foot, which would have a long-term present value of $1,632 per acre-foot. And, the Jicarilla Apache Nation is proposing subcontracts in the Rio Grande Basin for $500 per acre-foot, which would have a long-term present value of $10,880 per acre-foot.

36. In its annual report, the Northern Colorado Water Conservancy District reports the representative market price per unit for Colorado Big Thompson Project water. In an average year, a unit of project water is slightly less than one acre-foot. Between 1990 and 1995 the representative market price was approximately $1,500 per unit. Between 1995 and 1998 the price was between $2,100 and $3,500 per unit. In 1999 the price was $7,000 per unit. In 2000 the price was $15,000 per unit. And, between 2001 and 2003 the price was between $10,000 and $13,000 per unit. This annualized rate ranged from $70 per year per unit in 1990 to $698 per year per unit in 2002. The Colorado River Water Conservancy District web site includes the District's water marketing policy. This policy includes relatively low rates for short-term contracts for agriculture uses of $25 per acre-foot per year, higher rates for non-agriculture

contracts within the District and within the basin of $125 per acre-foot per year, and the highest rate for out-of basin contracts of $500 per acre-foot per year.

37. On the Navajo Nation the Peabody Coal Company coals lease terms, which include water payments, were negotiated in 1988. Based on those terms Peabody pays $587 per acre-foot per year for the first 2,800 acre-feet of water used, and $1,173 per acre-foot per year for additional water. This payment is split between the Navajo Nation and the Hopi Tribe. Peabody uses approximately 4,000 acre-feet of water with a weighted average price of $770 per acre-foot per year, which would be a long-term present value of $16,500 acre-foot.

38. Pursuant to the Navajo Nation Water Code (Title 22 N.N.C.), the Resources Committee of the Navajo Nation has the authority to establish water use fees for the Navajo Nation. In 1997 the Navajo Nation Resources Committee passed a water use fee resolution (RCAP-65-97), which set the water use fee at $0.27 per thousand gallons ($88 per acre-foot per year) for commercial purposes, and $2.70 per thousand gallons ($800 per acre-foot per year) for industrial purposes. The water supply available from the Westwater and Cow Springs formations in the Crownpoint vicinity are high quality, reliable, and the development costs are relatively low. Therefore, based on the regional water rates described above, the Resources Committee's water use fee structure reflects a reasonable range for the economic opportunity cost of water, if for any reason, these water sources are jeopardized, and cannot be used by the Navajo Nation for future development.

(D) The non-commercial value of the water needed for a sustainable economy and permanent homeland for the Navajo people can be considered to be much greater than the commercial opportunity costs if there is a significant risk to the drinking-water wells in the vicinity of the communities of Church Rock or Crownpoint.

39. The Navajo leadership must consider the deeply held cultural beliefs regarding the nature of the water resources of the Navajo Nation. Navajo leaders frequently state that, for

the Navajo people, water is life. Water is central to Navajo culture, and the Navajo Nation Council has insisted that the use of the Navajo Nation's water resources must be consistent with the present and long-term interests of the Navajo people. For the Navajo Nation the value of water as a commodity is overshadowed by the value of water needed to create and sustain a permanent homeland for the Navajo People. The purposes of the Navajo Nation Water Code are to: 1) provide for a permanent homeland, 2) to protect the health, welfare and economic security of the citizens of the Navajo Nation, 3) to develop, manage, and preserve the water resources of the Navajo Nation, 4) to secure a just ad equitable distribution of the use of water within the Navajo Nation, and 5) to provide for the exercise of self government.

40. In 2003 the Navajo Nation Division of Economic Development reported that the median Navajo family income was only $22,000 while the median U.S. family income was more than $50,000. The average Navajo Nation per capita income was less than $7,300 while the average U.S. per capita income was approximately $22,000. More than 40 percent of the Navajo families on the reservation lived below the federal poverty levels, compared with less than 13 percent of the general U.S. population. The Navajo unemployment rate on the reservation is 42 percent, compared to an unemployment rate for the U.S. of approximately 5 percent. While the surrounding regional economy has boomed, these gaps in income, unemployment and poverty have persisted. (Navajo Nation Division of Economic Development, 2003).

41. The Navajo Nation also faces serious water resource problems. For instance, according to the 2000 U.S. Census approximately 30 percent of Navajo homes do not have complete kitchens or plumbing facilities, and between 25 and 30 percent of Navajo households are without connections to a public water system. In 2004 the Indian Health Service sanitation deficiency system list included more than $300 million of deficiencies. (EcoSystems, 2003).

42. The lack of infrastructure, the lack of economic development, and the sustained poverty are closely connected. Water infrastructure is a necessary, but not sufficient condition for developing a sustainable economy that may alleviate poverty on the Reservation. However, broad infrastructure investment is occurring on the Navajo Nation. For instance, the BIA Navajo Area Office of Road Construction anticipates expenditures of almost $60 million per year during the next twenty years. The Navajo Housing Authority is investing almost $90 million per year to address the critical housing shortage. The Indian Health Service is investing approximately $20 million per year to address sanitation deficiencies. The Division of Economic Development has a list of priority economic development projects that has an estimated implementation cost of approximately $300 million. These infrastructure investments demonstrate the significant effort that is being made to create a permanent homeland for the Navajo people (Navajo Nation Department of Water Resources, 2000).

43. However, due to the stagnation of the Navajo economy Navajo people are unable to find a livelihood on the Navajo Reservation, and many of them are leaving. In the 1996 *Chapter Images* report, the Division of Community Development reported that the Navajo Nation is losing population to off-reservation communities. The Division projected that by 2012 more than half of the Navajo people will be living off of the reservation. And, according to the 2000 U.S. Census, almost 40 percent of the Navajo people reside off of the Navajo Reservation. The Navajo Nation is committed to reducing out migration as much as possible. Ibid.

44. As the broad investments in infrastructure are made, the inadequate water infrastructure becomes a more limiting constraint on new homes, schools, hospitals, and commercial activity. And, if the investments in the water infrastructure close the economic disparity between the on-reservation and off-reservation incomes by only a small fraction, then

the potential benefits of these investments are overwhelming. Conversely, if the water supply is jeopardized and the needed water infrastructure cannot be developed, the negative impacts are equally severe. Lexicon, 1999.

Summation

45. The Navajo Nation's use of the groundwater from the Westwater and Cow Springs formations is projected to increase over the next 40 years.

46. The Dakota, Westwater Canyon and Cow Springs Sandstone aquifers are used extensively for drinking water in the Eastern Navajo Agency and meet the definition of underground sources of drinking water.

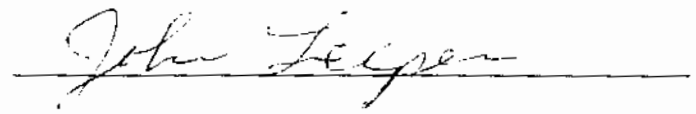
47. The 1999 Water Use Fee Structure adopted by the Resources Committee reflects a reasonable range for determining the economic opportunity cost of the water supply available from the Westwater and Cow Springs formations if those sources cannot be used in the future.

48. The economic value of the water resources does not fully reflect the value of water in Navajo culture and in its essential role in establishing a sustainable economy and a permanent homeland for the Navajo People.

49. This concludes my testimony.

Pursuant 28 U.S.C. §1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on the 1 day of March 2005.



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